CLAIMS

What is claimed is:

1. A semiconductor structure, comprising:

a semiconductor substrate;

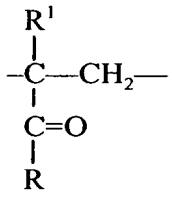
a resist over the semiconductor substrate; and

a light-degradable surface coupling agent between the resist and the semiconductor substrate.

2. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent comprises one or more selected from the group consisting of lactic acid polymers, lactic acid copolymers, polymers and copolymers containing side chain ketone groups, mixtures of polymers and an organometallic compound or a metal salt, and functionalized siloxanes.

3. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent comprises monomers of lactic acid and optionally one or more modifying monomers selected from the group consisting of glycols, p-dioxanone, 1,5 dioxepan-2-one, 1,4-oxathialan-2-one, and 4,4-dioxide.

4. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent comprises a polymer or copolymer comprising side chain ketone groups, wherein the ketone groups are represented by the chemical structure:

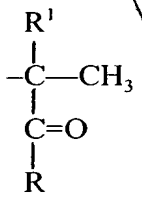


where R is an alkyl, cycloalkyl, aryl, alkenyl, or alkaryl group containing from one to about 10 carbon atoms and R^1 is hydrogen or an alkyl, cycloalkyl, aryl, or alkaryl group containing from one to about 7 carbon atoms.

5. The semiconductor structure of claim 4, wherein the polymer or copolymer comprises a polyester, a polyamide, or a polyurethane.

6. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent comprises mixtures of a polymer and an organometallic compound or a metal salt, and the polymer comprises a polyolefin or a polyvinyl alcohol.

7. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent comprises a functionalized siloxane made by coupling a ketone group with a silicon containing compound, the ketone group represented by the chemical structure:



where R is an alkyl, cycloalkyl, aryl, alkenyl, or alkaryl group containing from one to about 10 carbon atoms and R^1 is hydrogen or an alkyl, cycloalkyl, aryl, or alkaryl group containing from one to about 7 carbon atoms, the silicon containing compound comprising at least one selected from the group consisting of silane, hexamethyldisilazane, trimethylsilyldiethylamine, trimethylsilyldimethylamine, dimethylsilyldiethylamine, dimethylsilyldimethylamine, tetramethyldisilazane, trimethylmethoxysilane, trimethylethoxysilane, trimethylpropoxysilane, trimethylacetoxysilane, bis(dimethylamino)dimethylsilane, bis(dimethylamino)methylsilane, methyldimethylaminoethoxysilane, methyldimethoxysilane, methyldiethyoxysilane, dimethyldimethoxysilane, dimethyldiethoxysilane, and methyltrimethoxysilane.

8. The semiconductor structure of claim 1, wherein the light-degradable surface coupling agent forms a thin film having a thickness from about 25 Å to about 750 Å.

9. A method of processing a semiconductor structure, comprising:

depositing a light-degradable surface coupling agent on a semiconductor substrate;

depositing a resist over the light-degradable surface coupling agent;

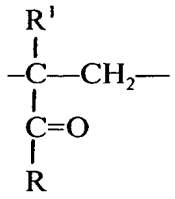
irradiating portions of the resist, wherein the light-degradable surface coupling agent under the irradiated portions of the resist at least partially decomposes; and

developing the resist.

10. The method of claim 9, wherein the light-degradable surface coupling agent comprises one or more selected from the group consisting of lactic acid polymers, lactic acid copolymers, polymers and copolymers containing side chain ketone groups, mixtures of polymers and an organometallic compound or a metal salt, and functionalized siloxanes.

11. The method of claim 9, wherein the light-degradable surface coupling agent comprises monomers of lactic acid and optionally one or more modifying monomers selected from the group consisting of glycols, p-dioxanone, 1,5 dioxepan-2-one, 1,4-oxathialan-2-one, and 4,4-dioxide.

12. The method of claim 9, wherein the light-degradable surface coupling agent comprises a polymer or copolymer comprising side chain ketone groups, wherein the ketone groups are represented by the chemical structure:



where R is an alkyl, cycloalkyl, aryl, alkenyl, or alkaryl group containing from one to about 10 carbon atoms and R^1 is hydrogen or an alkyl, cycloalkyl, aryl, or alkaryl group containing from one to about 7 carbon atoms.

13. The method of claim 12, wherein the polymer or copolymer comprises a polyester, a polyamide, or a polyurethane.

14. The method of claim 9, wherein the light-degradable surface coupling agent forms a thin film having a thickness from about 50 Å to about 500 Å.

15. A method of increasing adhesion between non-irradiated portions of a resist and a semiconductor substrate while improving removal of irradiated portions of the resist from the semiconductor substrate during development, comprising:

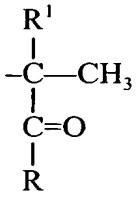
employing a light-degradable surface coupling agent having a thickness from about 10 Å to about 1,000 Å between the resist and the semiconductor substrate.

16. The method of claim 15, wherein the light-degradable surface coupling agent comprises one or more selected from the group consisting of lactic acid polymers, lactic acid copolymers, polymers and copolymers containing side chain ketone groups, mixtures of polymers and an organometallic compound or a metal salt, and functionalized siloxanes.

17. The method of claim 15, wherein light-degradable surface coupling agent comprises monomers of lactic acid and optionally one or more modifying monomers selected from the group consisting of glycols, p-dioxanone, 1,5 dioxepan-2-one, 1,4-oxathialan-2-one, and 4,4-dioxide.

18. The method of claim 15, wherein the light-degradable surface coupling agent comprises mixtures of a polymer and an organometallic compound or a metal salt, and the polymer comprises a polyolefin or a polyvinyl alcohol.

19. The method of claim 15, wherein the light-degradable surface coupling agent comprises a functionalized siloxane made by coupling a ketone group with a silicon containing compound, the ketone group represented by the chemical structure:



where R is an alkyl, cycloalkyl, aryl, alkenyl, or alkaryl group containing from one to about 10 carbon atoms and R^1 is hydrogen or an alkyl, cycloalkyl, aryl, or alkaryl group containing from one to about 7 carbon atoms, the silicon containing compound comprising at least one selected from the group consisting of silane, hexamethyldisilazane, trimethylsilyldiethylamine, trimethylsilyldimethylamine, dimethylsilyldiethylamine, dimethylsilyldimethylamine, tetramethyldisilazane, trimethylmethoxysilane, trimethylethoxysilane, trimethylpropoxysilane, trimethylacetoxysilane, bis(dimethylamino)dimethylsilane, bis(dimethylamino)methylsilane, methyldimethylaminoethoxysilane, methyldimethoxysilane, methyldiethyoxysilane, dimethyldimethoxysilane, dimethyldiethoxysilane, and methyltrimethoxysilane.

20. A semiconductor processing system, comprising:

a processing chamber operable to form a light-degradable surface coupling agent layer on a substrate in the chamber;

a supply of a light-degradable surface coupling agent; and

a measurement system for in situ measuring a thickness of the light-degradable surface coupling agent layer being formed and for providing a measurement signal indicative of the measured thickness.

21. The semiconductor processing system according to claim 20, further comprising a control system for controlling operating characteristics of the light-degradable surface coupling agent layer formation within the chamber, the control system adjusting the operating characteristics to control formation of the light-degradable surface coupling agent layer based on the measurement signal.

22. The semiconductor processing system according to claim 20, wherein the measurement system comprises one selected from the group consisting of a scatterometry system, an ellipsometry system, an x-ray reflectometry system.

23. A system for monitoring a light-degradable surface coupling agent layer formation process, comprising:

means for measuring thickness of a light-degradable surface coupling agent layer while being formed; and

means for providing a measurement signal indicative of the measured thickness.

24. The system according to claim 23, further comprising control means for controlling formation of the light-degradable surface coupling agent layer, the control means adjusting operating characteristics associated with the light-degradable surface coupling agent layer formation based on the measurement signal.